Annual Report

Production Sector

OMB Control No. 2060-0328
Expires 07/31/2011

Company Information

Company Name: **Noble Energy, Inc. (NEI)**
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Company Information Updated: **Yes**

Activities Reported

BMP1: No **BMP2: No** **BMP3: Yes**

Total Methane Emission Reductions Reported This Year: **164,000**

Previous Years' Activities Reported: **Yes**

Period Covered by Report

From: **01/01/2009** To: **12/31/2009**

☑ I hereby certify the accuracy of the data contained in this report.

Additional Comments
Noble Energy, Inc. (NEI) is pleased to submit the enclosed Annual Report detailing our participation in the EPA Natural Gas STAR Program in 2009.

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BMP3: Partner Reported Opportunities (PROs)

Current Year Activities

A. Facility/location identifier information:

Wattenberg Operations Area

B. Description of PRO

Please specify the technology or practice that was implemented:

Artificial lift: install smart lift automated systems on gas wells (10 years)

Please describe how your company implemented this PRO:

"Smart" automation system was installed on 715 gas wells in 2009 in the Wattenberg Operations Area. The "Smart" automation system monitors the well's production parameters such as tubing and casing pressures, flow rate, and plunger travel times. These remote telemetry units coupled with company software optimize plunger lift usage, which results in fewer well blowdown events.

C. Level of Implementation
Number of units installed: 715 units

D. Methane Emissions Reduction
Methane Emissions Reduction: **21,000 Mcf/year**

Basis for the emissions reduction estimate: **Other**

Assuming natural gas is an ideal gas and assuming standard conditions, the Ideal Gas Law equation can be applied to calculate the volume of gas vented per well blowdown. The variables used in the ideal gas law calculations are given below:

Tubing:
Average initial pressure = 170 psig
Final pressure = 0 psig
Average tubing volume = 152 cubic feet
~1800 cubic feet gas emitted per well blowdown event

Casing:
Average initial pressure = 700 psig
Final pressure = 400 psig
Average tubing volume = 415 cubic feet
~8500 cubic feet gas emitted per well blowdown event

Tubing and Casing:
1800 + 8500 = 10000 scf = 10 mcf gas emitted per well blowdown event

Estimated number of blowdown events/well-year:
Un-automated wells = 4.2*
Automated wells = 0.2**
Savings due to smart automation= 4.0
*Number of well blowdown events for un-automated wells is based on 2008 data
**Assumes 95% reduction in blowdown events after automation, based on field estimates

Savings:
4 blowdowns/well-year * 10 mcf gas/blowdown * 0.741 mcf CH4/mcf gas * 715 wells = 21,000 mcf CH4 saved
(Calculations assume gas saved is 74.1% methane by volume)

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E. Are these emissions reductions a one-year reduction or a multi-year reduction?

✓ One-year Multi-year

If Multi-year:

Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration.

Partner will report this activity annually up to allowed sunset date.

F. Cost Summary
Estimated cost of implementing the PRO (including equipment and labor): **$ 8,600,000**

G. Total Value of Gas Saved
Value of Gas Saved: **$ 84,000**
$ / Mcf used: **$ 4.00**

H. Planned Future Activities
To what extent do you expect to implement this PRO next year?: **The automation program is ongoing in the Wattenberg operations area.**

Previous Years' Activities

Year	Frequency of practice/activity or # of Installations	Total Cost * ($)	Estimated Reductions (Mcf/Yr)	Value of Gas Saved ($)
2008	544	6,500,000	18,000	72,000

* Total cost of practice/activity (including equipment and labor)

Additional Comments

1) Cost summary was based on an estimated average cost of $12,000/well

2) As of March 12, 2010, the “Smart” automation system has been installed on 1745 gas wells. The ultimate plan is to have all wells automated in the Wattenberg Operations Area.

3) The sunset date is stated as ten years in duration for this BMP (installing a smart lift automated system on gas wells). The automatic form is only allowing the "one-year" option to be chosen. However, NEI wants to report this activity once and let EPA automatically calculate future emission reductions based on the sunset date duration.

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BMP3: Partner Reported Opportunities (PROs)

Current Year Activities

A. Facility/location identifier information:

Wattenberg Operations Area

B. Description of PRO

Please specify the technology or practice that was implemented:

DI&M: survey and repair leaks

Please describe how your company implemented this PRO:

As part of NEI's maintenance program in the Wattenberg Operations Area, NEI performs leak imaging surveys of its equipment on leases using an IR camera. Fugitive leaks are identified using the IR camera and are repaired immediately if possible. When a leak cannot be repaired immediately upon discovery, the leak is identified and tagged for future repair.

C. Level of Implementation

Other: Leak imaging surveys were completed as part of this maintenance program on approximately 757 randomly selected leases in 2009.
About 480 repairs to minimize fugitive leaks were completed as a result of this program.

D. Methane Emissions Reduction

Methane Emissions Reduction: **13,000 Mcf/year**

Basis for the emissions reduction estimate: **Other**

The Gas STAR Emission Reduction Quantification Reference Guide document was used as the basis for the emission reduction calculations related to the directed inspection and maintenance program.
The "Lessons Learned" emission factors for various component types were used
along with the following equation:

ER = EF • AF • XCH4 • 70% reduction on average through DI&M

Where,
ER = Emissions Reductions (Mcf/year)
EF = Emissions Reductions Factors (Mcf/year)
AF = Activity Factor (number of components)
XCH4 = Mole fraction of methane in the gas -Assumed 74.1% for the Wattenberg Operations Area

Each of the repairs completed due to the directed inspection and maintenance program were categorized based on the leaking component as follows: pressure relief valve, connection, flange, or open ended line. The emission factor corresponding to each of these components was used along with the equation listed above to estimate the emission savings obtained from repairing each of the identified leaks.

Reference: epa.gov/gasstar/documents/xls/quantifying_ngs_methane_reductions.xls.

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E. Are these emissions reductions a one-year reduction or a multi-year reduction?

✓ One-year Multi-year

If Multi-year:

Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration.

Partner will report this activity annually up to allowed sunset date.

F. Cost Summary

Estimated cost of implementing the PRO (including equipment and labor): **$ 160,000**

G. Total Value of Gas Saved

Value of Gas Saved: **$ 52,000**

$ / Mcf used: **$ 4.00**

H. Planned Future Activities

To what extent do you expect to implement this PRO next year?: **The directed inspection and maintenance program using an IR camera is an on-going program**

Previous Years' Activities

Year	Frequency of practice/activity or # of Installations	Total Cost * ($)	Estimated Reductions (Mcf/Yr)	Value of Gas Saved ($)

* Total cost of practice/activity (including equipment and labor)

Additional Comments

1) The reported cost estimate includes the cost of the IR camera as well as internal labor and vehicle costs.

2) The directed inspection and maintenance program using an IR camera is an on-going program in the Wattenberg Operations Area, and the program is planned to continue in 2010.

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BMP3: Partner Reported Opportunities (PROs)

Current Year Activities

A. Facility/location identifier information:

Shattuck Operations Area in Mid-Con Business Unit

B. Description of PRO

Please specify the technology or practice that was implemented:

Perform reduced emissions completions

Please describe how your company implemented this PRO:

In the Shattuck Operations Area, NEI utilizes carbon-dioxide (CO2) for fracturing, which leads to flowback gas containing high concentrations of CO2. This flowback gas is typically flared for days until the CO2 concentration in the flowback gas is reduced to less than the maximum allowable pipeline concentration. Using a CO2 membrane system to decrease the amount of CO2 in the flowback gas allows most of this gas which was conventionally flared to be sold instead.

C. Level of Implementation

Other: Nine flowbacks were completed using the CO2 membrane system in 2009 in the Shattuck Operations Area.

D. Methane Emissions Reduction

Methane Emissions Reduction: **130,000 Mcf/year**

Basis for the emissions reduction estimate: **Actual field measurement**

E. Are these emissions reductions a one-year reduction or a multi-year reduction?

✓ One-year Multi-year

If Multi-year:

Partner will report this activity once and let EPA automatically calculate future emission reductions based on sunset date duration.

Partner will report this activity annually up to allowed sunset date.

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F. Cost Summary
Estimated cost of implementing the PRO (including equipment and labor): **$ 326,000**

G. Total Value of Gas Saved
Value of Gas Saved: **$ 520,000**
$ / Mcf used: **$ 4.00**

H. Planned Future Activities
To what extent do you expect to implement this PRO next year?: **In 2010, NEI intends to utilize the CO2 membrane system when available.**

Previous Years' Activities

Year	Frequency of practice/activity or # of Installations	Total Cost * ($)	Estimated Reductions (Mcf/Yr)	Value of Gas Saved ($)

* Total cost of practice/activity (including equipment and labor)

Additional Comments

1) The total estimated cost includes the CO2 membrane system rental cost and contract labor cost of $4,000 per day. Internal labor costs were not included.

2) In the Shattuck Operations Area in 2009, with the use of the CO2 membrane system, conventionally flared gas was sold. The volume of gas sold due to the CO2 membrane system was obtained by totaling daily field-measured flowback volumes from when the CO2 membrane system was hooked up and conventionally flared gas was sold to when the CO2 concentration in the inlet to the CO2 membrane system met pipeline specifications and the CO2 membrane system could be removed. The CO2 concentrations of the inlet gas were obtained from field measurements as well as from lab analyses. Based on these criteria, the following volumes of gas (mcf) per flowback were sold instead of flared: 8,000; 5,000; 7,000; 13,000; 19,000; 14,000; 5,000; 87,000; and 17,000. Gas samples, obtained from the gas exiting the CO2 membrane unit, were analyzed to estimate the concentration of methane for each of these flowbacks. Values ranged from 70% to 77% methane by volume.

3) The CO2 membrane system is available contractually by a third party company. Thus, in 2010, NEI intends to utilize the system when available.

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Additional Accomplishments

NEI has developed a Climate Change Awareness Presentation and plans to present this to various internal business groups to increase awareness regarding NEI's climate change program and encourage participation in reducing NEI's methane emissions.

NEI intends to develop a Rewards and Recognition Program as part of NEI's internal training program. This program will provide incentives to NEI employees for identifying and implementing methane emission reduction projects. This program will emphasize NEI's commitment to reducing methane emissions as well as give employees a vested interest in quantifiable reductions.

NEI also plans to offer various climate change workshops. These workshops will provide the internal business groups a chance to analyze area-specific methane emissions, brainstorm methane emission reduction projects for their operational areas, and formulate a plan for executing the methane emission reduction projects.